Energy Systems p81 Text

1) ATP -PC System
2) Glycolytic System
3) Oxidative System

ADP + P => ATP

For each System; Using p81 text
Outline
- Aerobic or Anaerobic
- Byproduct Lactic Acid? What is the effect?
- Energy Source?
- Where is it found in the body?
- Limiting Factors
- Time Frame
- Basic Equations
- How Many ATP?
- What sports use system?

Oct 27-8:00 AM

Energy Systems Review

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Energy Systems - ATP-PC

1. Anaerobic
2. There is no byproduct therefore no effect-creatine
3. Its energy source is creatine phosphate
4. It is found in the cytoplasm located in the belly of the muscle
5. The limiting factor is the short duration (small storage ATP and Creatine Phosphate)
6. 0- 10-15 seconds
7. PC+ADP=ATP + creatine
8. Advantages of this is quick surges of power
9. The muscle fiber type IIB (fast twitch, glycolytic)
10. Athletes that perform in activities such as weightlifting, sprinting, jumping, etc have this type of energy system.

Creatine Kinase
Increase-training = some increase creatine storage

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Glycolytic System

- Also known as glycolysis.
- This system is anaerobic, meaning it does not require oxygen to produce.
- Pyruvic Acid is produced as a result of glycolysis, meaning that the pyruvic acid is converted into lactic acid as a byproduct.
- The energy sources include glucose and invested ATP. (blood -glucose, liver glycogen)
- Both the energy produced (ATP) and lactic acid can be found in the muscles of the body. Occurs in cytoplasm.
- The buildup of **lactic acid**, or there isn't sufficient glucose available, are limiting factors such as pain and fatigue; along with the removal period of 1-2 hours of rest activity
OR 30-60 minutes of exercise (active) recovery.
-Lasts up to 15-120s

- Advantage: quick surge of power
- The ATP produced gives an athlete 1-3 additional minutes of energy for medium-term activities (200m/800m track events, or a shift in a hockey game).
- $C_6H_{12}O_6 + 2ADP + 2Pi => 2C_3H_6O_3 + 2ATP + 2H_2O$
- a net yield of 2 ATP
- muscle fibre type IIA (fast twitch)

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The Oxidative System
Aerobic Alactic

The oxidative system is aerobic.
Lactic acid is not a byproduct of this system, rather water and carbon dioxide is the byproduct.
Energy source is fats, glycogen, and proteins and is processed in the mitochondria.
The limited factors is that it's slow (ie it takes time to activate)
Conditioning
The time frame for this system is 120 seconds and beyond.
$C_6H_{12}O_6 + 36ADP + 36\ Pi \rightarrow 6CO_2 + 6H_2O + 36\ ATP$
36 ATP will be produced
Step 1: Glycolysis
One glucose is enzyme mediated into fructose diphosphate, then enzyme mediated into 2 pyruvates. 2 ATP were produced in this step, and two co-enzymes were loaded with hydrogen. Pyruvates are transferred to a separate step, which are then converted into Acetyl CoA
Step 2: Krebs Cycle
The acetyl Co-A is enzyme mediated a number of times (8), two ATP are produced, and a number of co-enzymes are loaded with hydrogen, to be transported to step 3.
Step 3: ETC (electron transport chain)
The co-enzymes reappear with the H atoms, which go through a lengthy process.
In the end, 36 ATP are produced, as well as CO_2 and H_2O
Step 1 - 2 ATP
Step 2 - 2 ATP
Step 3 - 32 ATP
Athletes affected are Cyclists, Canoeist, Orienteering, Marathon Runners

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Fuel Sources for Oxidative Phosphorylation

Carbohydrates, Fats and Proteins all are converted to Acetyl CoA through various processes and enter the Krebs Cycle to be used for energy
- Glucose (sugars) and Glycogen (carbohydrates) enter via Glycolysis
- Fats enter via Lipolysis
- Proteins enter via Glucogenesis and Lipogenesis

Stored Energy - Fuel Breakdown

Fats	9kcal/g	(2)
Carbohydrates	4kcal/g	(1)
Protein	4kcal/g	(3)

Over training

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Although fats provide more kilocalories of energy per gram than carbohydrates, fat oxidation requires more oxygen than carbohydrate oxidation and is therefore less efficient.

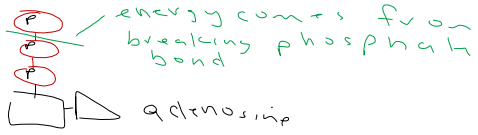
- Fat provides 5.6 ATP molecules per molecule of O_2
- Carbohydrates provide 6.3 ATP molecules per molecule of O_2

Therefore Carbohydrates are the preferred Fuel source for high-intensity long duration exercise

Oct 27-10:25 AM

ATP-CP

ATP_CP
Foud in muscle fidres.
Anerobic No oxygen
Just Creatine Builds up muscle
10-15 seconds Not enough creatine-phosphate



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Oct 16-7:24 AM

30% VO_2

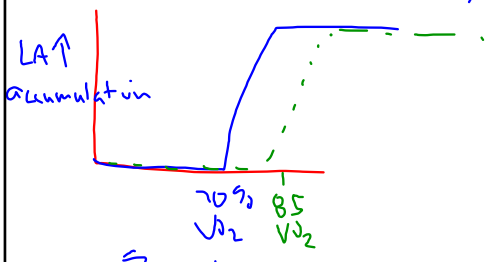
EPOC-relieve LA

- decrease HR & ventilation

= thermoregulate
replenish ATP stores

Oct 16-1:54 PM

Anaerobic Threshold / OBLA



↑ VO_2
Interval Training

Jan 20-1:29 PM

VO_2 Lab

30-40 average female
40-50 average male

O_2
L/min → bring in and metabolize

Jan 20-1:33 PM